COURSE DESCRIPTION CARD - SYLLABUS

Course name
Circuit theory [N1EiT1>TO]

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

7,00

Coordinators

dr inż. Andrzej Woźniak
andrzej.wozniak@put.poznan.pl

Lecturers

dr inż. Andrzej Woźniak
andrzej.wozniak@put.poznan.pl

Prerequisites

The student starting this course should have basic knowledge of the basics of physics in the field of electrical and magnetic phenomena. He should also know the basics of mathematics, especially in the fields of mathematical analysis and algebra. He should also have the ability to obtain information from the indicated sources and be ready to cooperate as part of the team.

Course objective

Provide students with basic knowledge of the theory of electric circuits, which is the basis for introducing the problems of electronics and electrical engineering. Obtaining by the student knowledge and skills to calculate DC and sinusoidal current circuits.

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified in the form of a 90-minute written exam consisting of 5 - 6 questions. Questions take the form of tasks to be solved or tasks consisting in explaining the essence of a given phenomenon or operation of a given method. Each question is scored on a scale from 0.1 to 1. The exam is passed when the number of points scored exceeds 50%.
The skills acquired during the exercises are verified on the basis of a final test consisting of 5 - 6 questions. Questions take the form of tasks to be solved. Each task is marked on a scale from 0.1 to 1. Assessment takes place during the last class and lasts 90 minutes. The pass mark is 50% of the points.

Programme content

Basic concepts and theoretical-circuit elements. Electrical signals. Magnetic coupling. Sources.
DC circuits and methods of analyzing these circuits.
Network methods of DC circuits.
Steady state sinusoidal AC circuits. Complex notation.
Power and adjustment for maximum power. Methods of analyzing sinusoidal alternating current circuits in a steady state.
Resonant circuits.

Course topics

Lecture:
Basic concepts and theoretical-circuit elements: resistor, capacitor, inductor, transformer, gyrator. Electrical signals. Magnetic coupling and coupled inductances. Independent and controlled sources.
DC circuits: Kircchoff's laws, power, voltage divider, source bonding, star-triangle and star-delta transform. Methods of analyzing DC circuits: equivalent resistance, source switching, the Thevenin and Notron method, method of superposition. Network methods of direct current circuits: classical, loop currents, nodal potentials.
Steady state sinusoidal AC circuits. Complex notation, the concept of ipedance and admittance. Power: momentary, active, reactive and apparent. Power in R, L, C elements. Adjustment for maximum power. Methods of analyzing sinusoidal alternating current circuits in a steady state - analogies to methods in direct current circuits. Branch and network methods.
Resonant Circuits: series, parallel, two-branch resonant circuit.

Exercises:
Practical application of lecture knowledge in solving tasks.
DC Resistive Circuits:
- Ohm's law, connecting resistors, voltage divider, current divider, circuit winding (equivalent resistance), active power.
- Kirchhoff's laws, method of superposition, theorem. Thevenin and Norton, transforming sources, matching to max. active power.
- Classical method of ring currents and nodal potentials.
Steady-state sinusoidal AC circuits.
- Sinusoidal alternating current, effective value, instantaneous power, symbolic method (complex numbers), impedances, active, reactive, apparent and complex power.
- Magnetic coupling, superposition method, Thevenin and Norton method, node potential method, loop current method (and loop current method with couplings).
- Resonant circuits: series resonance, parallel, two-branch resonant circuit.

Teaching methods

Lecture: traditional, consisting in the presentation and explanation of phenomena, laws, methods with examples.

Exercises: solving example tasks on the blackboard by both the teacher and students.

Bibliography

Basic.
1. Osiowski J., Szabatin J.: Fundamentals of Circuit Theory, Volume 1-3, WNT, Warszawa 2001.

2. Bolkowski S.: Theory of electrical circuits, WNT, Warszawa 2009.
3. Tadeusiewicz M., Circuit theory part I, II, Wyd. Politechniki Łódzkiej, Łódź 2000
4. Osowski S., Siwek K., Śmiałek M.: Circuit theory, Oficyna Wydawnicza Politechniki Warszawskiej, 2006

Additional.
1. Cholewicki T., Theoretical electrical engineering, WNT, 1971
2. Mikołajuk K., Basics of analysis of power electronic circuits, PWN, 1998, Warszawa
3. Mikołajuk K., Trzaska Z., Theoretical electrical engineering, Analysis and synthesis of electrical circuits, Warszawa PWN, 1987.

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	7,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	90	4,00